such posts as were available inadequately paid, but essential needs, such as well-equipped laboratories with adequate provision for maintenance, had not been provided.

In the forefront, therefore, of the measures that should be taken to link together practical agriculture and science should be placed the recruitment of the best scientific talent that the country can provide, and this can be secured only by providing suitable openings with reasonable prospects of advancement for the best of the graduates in science turned out annually by the universities. Programmes of research avail nothing in the absence of competent men to carry them out. We should like to see a scheme inaugurated under which promising graduates in science would be attracted to the study of the agricultural sciences by the provision of special fellowships under a guarantee that a certain number would eventually be selected for permanent posts carrying adequate salaries.

It is true that in the past most of the great discoveries have been made by men actuated merely by a love of knowledge for its own sake, and no doubt the future will not differ from the past in this respect; but the real point is that, if anything is to be accomplished by State action, an appeal must be made to the motives by which the majority of men are actuated in choosing their life career. There can be no question that if emoluments were placed upon a basis which would enable workers to live in reasonable comfort, while prospects of advancement were also improved, the fruits of the vineyard would be ample. Agriculture and horticulture are still in the main ruled by empiricism and tradition, and while it is true that many of the more recent advances in science go to confirm the wisdom of the ancients, no one can doubt that we are still far from possible ends in many directions. Scientific methods of plant breeding alone are capable of indefinite expansion. Scientific methods of controlling plant diseases can be foreshadowed with considerable confidence. The crop-bearing capacity of the soil may, as Mr. Lloyd George suggested, be increased by scientific means, and in the region of diseases of live stock the possibilities of progress have scarcely been explored.

The Prime Minister's declaration should not be forgotten. If agriculturists are alive to their interests they will see that it is not allowed to lapse into the oblivion which so ruthlessly overwhelms many of the platform promises of politicians.

NOTES.

In a letter to the *Times* of November 28, under the heading of "Gas Warfare," appears a plea for the establishment of "fresh safeguards" to prevent any nation from ever again employing gas as a weapon. The letter is signed by eight of the most highly placed members of the medical profession, who know from experience what immense suffering has been caused from the employment of asphyxiating gas in the present war. Those who have knowledge of the operations of our own gas offensive service will tell us that there must be very many of our present enemies who will heartily agree with the views expressed in this letter, so that on this point opinion would no doubt be unanimous. One of the objections raised in the letter to the *Times,* that gas is not a controllable weapon the effects of which can be limited to combatants, cannot be regarded as more true for gas when used under modern conditions than for shrapnel or high-explosive shells. There remains the view that the use of gas involves needless suffering; this argument applies with equal force to all the operations of war. If in the coming comity of nations mutual confidence can extend so far as to agree to the abolition of a form of warfare which has now been removed from the realm of theory (and in theory gas warfare is at least a century old) to that of accomplished fact, surely it can go one small step further and so abolish war altogether. This would be a more practicable measure; preparations to arm would attract attention, while preparations for this particular form of armament could be carried on in secret by any Power so inclined. In past wars the issue has been determined almost solely by military skill and valour; in the present war there has been an increasing application of scientific knowledge. Science has not merely striven to destroy enemy life; it has striven, and with equal success, to save British and Allied lives. The British pattern of gas respirator is the triumphant product of much exceedingly careful work, and has probably saved more lives than any other contrivance or procedure adopted during the war. Whether it is decided to drop the use of gas or not, it would be extremely unwise for us to discontinue to train our men in anti-gas measures unless general disarmament is agreed upon.

It might reasonably be expected that by now most people would know more about the aims and ideals of science than to repeat the old formula that science is in opposition to religion and detrimental to culture, yet in the *Scientific Monthly* (vol. vii., No. 5) Mr. E. P. Lewis finds it necessary to protest in an article entitled "The Ethical Value of Science" against the attitude of many current writers who directly or indirectly express such views. He quotes from various recent articles to the effect that science is largely responsible for the extirpation of culture and the growth of materialism; some writers attribute the war to the suppression of spiritual values by the influence of scientific doctrines, and its horrors to malignant investigators who spend their lives devising agencies of death and destruction. Such people overlook the fact that the statesmen immediately responsible for the outbreak and conduct of war are not scientific men. Science has nothing whatever to do with conquest, with commercial exploitation, or with upholding the divine right of dynasties. The end of all scientific investigation is to discover the truth about all things, including man, his instincts and impulses, his organisation in society. Were economists and politicians imbued with the scientific spirit it would be of incalculable benefit to the effective organisation of society. Science has no intention of decrying genuine religion, or of denying the importance of the so-called humanities, but it does maintain that the habit of mind developed by scientific studies is at least as important as an ethical agency. With the completion of the war it will be in a large measure the mission of science to rebuild a shattered civilisation; it will restore industries, house the homeless, feed the hungry, and cure the sick, and, not least, must aid in healing the deep-seated ills of society, the consequences of past social misconduct. If men will use for destruction the discoveries of science, it is not the scientific worker who is to blame.

In his recent speech at Wolverhampton Mr. Lloyd George, when referring to agriculture, spoke of the possibility of providing a national supply of fertilisers. It seems likely that a scheme has been put before him for the continuance of the present arrangements under which the Ministry of Munitions controls the manufacture of artificial fertilisers. In fact, it may be that the intention is that the State should actually undertake the manufacture of certain fertilisers. It is common knowledge that there are now in existence a number of State-owned sulphuric acid factories, and, further, that, inasmuch as the State has agreed to purchase a large proportion of the Australian output of zinc ores containing sulphides of the metal, it will be in a position to control the sulphuric acid output of the country. A State-owned supply of sulphuric acid naturally suggests the State manufacture of superphosphate and sulphate of ammonia in the interests of increased food production. Schemes of this nature for State trading of many kinds are likely to be put forward, but whether they will survive the opposition of manufacturers is perhaps doubtful.

In London the Registrar-General's returns show a very substantial decrease in the number of deaths from influenza in each of the two weeks ending November 16 and 23. The climax of the epidemic was attained in the two weeks ending November 2 and 9, in both of which influenza caused 57 per cent. of the deaths from all causes, whilst for the week ending November 23 only 42 per cent. of the total deaths were due to influenza. The epidemic has caused 9441 deaths in London during the seven weeks ending November 23, which is 47 per cent. of the deaths from all causes, whilst the percentage of deaths from pneumonia was 12, and from bronchitis 6. Chicago during the two weeks ending October 19 had respectively 571 and 1242 deaths from influenza, whilst in London the deaths were 80 and 371. In Paris the deaths for the week ending November 9 were 629, which is a decrease of 490 on the preceding week, whilst in London the decrease of deaths was 25 for the corresponding week. The closing week of November experienced a return of milder and more humid weather, and this possibly may lessen the continued decrease in the deaths from the epidemic. The reissue of the weather tables in the Registrar-General's returns is a welcome feature. The meteorological results for certain towns are already recommenced, and the table of Greenwich daily values is promised from the beginning of next year.

We regret to learn from *Science* of the death of Mr. H. S. Coe, agronomist in the United States Department of Agriculture, and author of numerous botanical and agricultural papers, on October 25, at thirty years of age; and of Prof. W. G. Mallory, associate professor of physics in Oberlin College, on October 19.

We regret to note that the death of Mr. Edmund Sharer is recorded in *Engineering* for November 29. Mr. Sharer, who was sixty-two years of age, was, up to a few years ago, shipyard director at the Dalmuir naval construction works of Messrs. William Beardmore and Co. He was responsible for the construction of many notable naval and mercantile vessels, and was a member, since 1894, of the Institution of Naval Architects.

By the death on December 3, at eighty-four years of age, of Dr. John Percival, formerly Bishop of Hereford, the nation has lost a vigorous worker and independent thinker whose whole active life was devoted to the furtherance of progressive aims. Dr. Percival was the first headmaster of Clifton College, and during his fifteen years' work there he brought this public school to the high position which it occupies. He was one of the founders of University College, Bristol, and took a leading part in all educational matters, particularly the education of women and the extension of university teaching. From Clifton Dr. Percival went to Oxford in 1878 as president of Trinity College, and in 1887 he became headmaster of Rugby School, where he had formerly been an assistant master. He was nominated Bishop of Hereford in 1895, and while in the Upper House he maintained on all occasions the broad principles and courage in expressing them which distinguished his career. He was the author of "The Universities and the Great Towns," and was president of the Educational Science Section of the British Association at the Cambridge meeting in 1904.

The death is announced of Mr. G. P. Rose, C.I.E., who began his career on the Indian State railways, and afterwards acted as executive engineer in the construction of the Chappar Rift works and bridge in the sand-swept, tortuous defiles of the river gorge on the Sind-Peshin railway. Mr. Rose also won the respect and confidence of the gangs of wild border men—Afridi, Waziri, and Baluch—upon whose assistance the success of the work depended. He superintended works on the line from Quetta to New Chaman and the Khojak tunnel. After acting as deputy manager of the North-Western State railways, his services were lent to the Nizam's Government, and he afterwards became junior consulting engineer to the Government of India. After his retirement in 1904 he joined the board of the Hyderabad (Deccan) Mining Co.

The death is announced, at the age of eighty-six, of Mr. N. C. Macnamara, consulting surgeon to Westminster Hospital, and vice-president of the Royal College of Surgeons in 1893 and 1896. Mr. Macnamara was appointed assistant surgeon in the Indian Medical Service in 1854, and became surgeon-major in 1873. During his career in India, which ended in 1876, he wrote on diseases of the eye, the history of Asiatic cholera, and other medical subjects. Returning to this country, he was in due course appointed surgeon and lecturer on clinical surgery at the Westminster Hospital, and later became consulting surgeon to the Westminster Ophthalmic Hospital. He published, among other works, "Lectures on Diseases of Bones and Joints" and "Instinct and Intelligence," which was published in 1915, when he was eighty-three years of age. In addition to numerous other activities, Mr. Macnamara was a member of the Departmental Committee on the Army and Navy Medical Service appointed by the War Office in 1889, a member of the Government of India Commission on Leprosy, and president of the Commission of the British Medical Association on Medical Education and a Teaching University for London.

The last of the first series of lectures arranged by the Industrial Reconstruction Council will be held in the Saddlers' Hall, Cheapside, E.C.2, on Wednesday, December 11. The chair will be taken at 4.30 by the Marquess of Salisbury, K.G., and a lecture on "Science and Industry" will be delivered by Sir William S. McCormick, of the Department of Industrial and Scientific Research. Applications for tickets should be made to the Secretary, I.R.C., 2 and 4 Tudor Street, E.C.4.

A general discussion on "The Relation of Science to the Non-ferrous Metals Industry" will form the central feature of the forthcoming annual general meeting of the Institute of Metals. At that meeting there will also be presented several important papers, the publication of which has been withheld owing to the operation of the censorship. The meeting is, therefore, to be anticipated with interest, as is also the annual May lecture, which will be delivered by Prof. F. Soddy on the subject of "Radio-activity." A local section of the Institute of Metals has been formed in Sheffield, the recently dissolved Sheffield Society of Applied Metallurgy forming the nucleus of the new section. The roll of the institute has increased by more than two hundred during the current year, and, in view of the probable advent of peace, it is expected that a total of 1200 members will soon be recorded, and that within a few months of the institute's tenth birthday.

THE first part of what will prove an extremely valuable report on the mammals of equatorial East Africa has just been issued by the United States National Museum (Bulletin No. 99). This is the work of Mr. N. Hollister, and embraces the Insectivora, Cheiroptera, and Carnivora. While great attention has been paid to synonymy and tables of measurements—matters of very real importance—a considerable amount of space has been devoted to notes on life-histories furnished by the various field collectors on expeditions sent out by the Museum during the last few years. No fewer than sixty type skulls are figured here for the first time. Furthermore, those interested in the phenomena of variation and in the skeletal changes wrought by captivity will find in this report some very striking facts.

SOME very disconcerting figures anent the slaughter of penguins for the sake of their oil appear in the *Victorian Naturalist* (vol. xxxv., No. 6). We are assured that, though as many as 1,500,000 are annually killed for this purpose, the colonies show no diminution in their numbers. We are glad to know that a representative of the Australian Ornithologists' Union is to visit the islands during the coming slaughtering season to investigate the charges of cruelty made against those engaged in this traffic, and also the assurances which have been given that, though the birds are slain by the million, their numbers show no reduction. This scarcely seems credible. Ornithologists the world over look with grave misgivings on the continuation of this devastating work, to which we trust an end will speedily be put.

THE observations on the nesting habits of the bullfinch by Miss Frances Pitt, which appear in *British Birds* for November, deserve the careful attention of students of animal behaviour as well as of ornithologists. During incubation, Miss Pitt remarks, the female is fed entirely by the male, and for the first six days after the hatching of the young he feeds both his mate and their offspring. He also, for the first few days, attends to the cleaning of the nest, passing some of the excrement to the female to swallow, and disposing of the rest himself. After the first day or two both parents undertake the removal of the excrement, which is no longer eaten, but carried off and dropped at a distance. At first the young are fed at intervals of about fifteen minutes, but by the time they are ready to fly nearly an hour elapses between each meal. As with so many young birds, the nestlings are greatly distressed by the midday heat, and lie gasping for breath, with their heads hanging over the edge of the nest. Each parent has its own path, which it invariably uses in returning to and departing from the nest—a trait which appears to be common to most birds. By the eighth day the nestlings show signs of developing feathers, and begin even to attempt to preen the growing stumps, probably to allay slight uneasiness, akin to itching, due to the ferment of vigorous growth.

DR. A. L. DU TOIT (Trans. Geol. Soc. S. Africa, vol. xxi., p. 53, 1918) describes an interesting intrusion of aplite into serpentine in Natal. The aplite has become overcharged with alumina, which has separated as corundum, while the serpentine has become penetrated by silica and locally converted into talc. The ferrous iron of the serpentine has separated out completely as minute octahedra of magnetite during the process. The same paper describes the occurrence of two sheets of magnetite containing ilmenite in a gabbro in the Tugela Valley. These cannot have separated by gravitation from the gabbro, and are regarded as intrusive bodies which retained their fluidity and oozed upwards under squeezing processes from the lower portion of the cauldron, leaving behind a residue of pyroxenes, and corroding and including silicates that had already separated in the overlying gabbro.

THE report of the fifth Indian Science Congress held at Lahore in January last, published in the Journal of the Asiatic Society of Bengal for August, consists of the usual presidential addresses and short abstracts of upwards of ninety papers; but with a few exceptions, notably in the sections of physics and zoology, the addresses and papers deal mainly with matters of economic, agricultural, and commercial interest. Without disparagement, the report may be said to illustrate chiefly the interested official view of science, which is fixed steadfastly on material benefits rather than lifted into the grand realms of creative imagination. From a considerable mass of such useful information we extract the interesting statement that, as one of the results of the war, several distilleries for the extraction of essential oils have been established in Southern India, and that experts now have confidence in the ability of India to supply the world's demand for sandal-oil and thymol. In the papers of purely scientific interest Messrs. Southwell and Baini Prashad have followed out the life-history of a new tapeworm of a shark, which passes its larval stage in the muscles of the Indian shad; Mr. M. J. Narasimhan mentions the isolation of a bacillus from root-nodules of Casuarina, which behaves like the nitrogen-fixing bacillus of the root-nodules of Leguminosæ; Messrs. E. Vredenberg and Das Gupta report the discovery at last of Upper Palæozoic fossils in the Krol beds of the Simla region; and Mr. C. A. Matley gives a brief description of Dinosaur remains from the Lameta beds of Jubbulpore.

THE forty-seventh annual report of the Deputy Master and Comptroller of the Royal Mint has just been issued. It refers to the operations of the year 1916. The total number of coins struck was 265·5 millions, which was nearly 59 millions more than in 1915, and is the highest figure on record. Owing to the continued withdrawal of gold from circulation, the great demand for silver coin which arose in the previous year was continued, and no fewer than 127 million pieces were struck, against an average of 49 millions for the previous ten years. A very great increase in copper coinage also took place, and 136·8 million coins were struck. On the other hand, only 1·5 million gold coins were struck, as compared with an average of 24 millions in the previous ten years. The sterling value of the total coinage in 1916 was 10,386,137*l*., as compared with 29,385,568*l*. in 1915. During the year the Mint, Birmingham, Ltd., struck 33·7 million coins, under the supervision of the Royal Mint, for British Colonies and Dependencies. This firm also supplied the Royal Mint, for Imperial coinage, with silver and bronze blanks. The general account of expenses and receipts shows a profit of 4·5*l.* millions, as against 4·7*l.* millions in the previous year. The principal item included is the profit on the silver coinage, but although the issue of silver coins in 1916 was greater than in 1915, the higher cost of the bullion resulted in a reduction in the net profit under this head. Receipts of work done for the War Office show a considerable increase in value, but the suspension of Colonial coinages has resulted in the disappearance of any item on this account. As was to be expected, general expenses were decidedly higher than in previous years.

THE important bearing on the food supply of artificial manures containing phosphorus lends particular interest to a communication by Dr. C. Doelter in the *Oesterreichische Chemiker- und Techniker-Zeitung* for September 15 and October 1 regarding the mineral wealth of the Ukraine. Phosphorite is found there in many districts, in some parts in great abundance. Large quantities are said to be obtainable from open-cast workings at low cost. Ground phosphorite was exported to Austria in considerable quantities before the war. It generally contains a high percentage of calcium phosphate, while analysis shows 27·5 per cent. of phosphoric acid. To derive the full value from the deposits they should be worked systematically, and not by the primitive methods employed formerly.

DR. BECKMANN recently gave an account before the German Institution of Electrical Engineers of the progress that has been made in training disabled soldiers to enable them to carry out work in engineering factories. A number of photographs are reproduced in *Elektrotechnische Zeitschrift* for September 19 and 26 (in which the account is published) showing the methods adopted to enable such men to operate machine-tools. Particular stress is placed on the success of a method, devised by Dr. Krukenberg, to enable soldiers who have suffered amputation of the forearm to work machines. A further communication by P. Perls refers to the employment of the blind in factories. The photographs show men at work on a variety of machining operations and the means of protecting them from accidents. It is stated that blinded soldiers have been employed with success in twenty-six occupations.

THE law of decay of phosphorescent light emitted by a body after stimulation has hitherto been taken to be of simple form. If I is the intensity and t the time since stimulation, I was taken inversely proportional to $(a+bt)^2$. According to a communication to the National Academy of Sciences of America by Prof. E. L. Nichols and Mr. H. L. Howes, which appears in the October issue of the Proceedings of the Academy, the law of decay is not so simple. They find that there are two types of decay for the phosphorescence of short duration. If the inverse square root of the intensity as ordinate is plotted against the time as abscissa, in the first type the curve rises as the time increases, but the rate of rise decreases as time goes on; and in the second the curve rises, and the rate of rise increases with the time. The first type of phosphorescence the authors propose to call the "persistent," and the second the "vanishing," type. The two types may be exhibited by the same material, *e.g.* calcite, stimulated by ultra-violet light, gives phosphorescence of the vanishing, and, when stimulated by cathode rays, of the persistent, type.

AMONG forthcoming books we notice "Technical Handbook of Oils, Fats, and Waxes," P. J. Fryer and F. E. Weston, vol. ii. (*Cambridge University Press*); "Lice and their Menace to Man," Lieut. Ll. Lloyd, with a chapter on "Trench Fever," by Major W. Byam, R.A.M.C., illustrated (*Henry Frowde and Hodder and Stoughton*); "The Iron Circle: The Future of German Industrial Exports," Prof. S. Herzog, translated (*Hodder and Stoughton*); "Text-book of Military Aeronautics," H. Woodhouse (*T. Werner Laurie, Ltd.*); "Boiler Chemistry," J. H. Paul, a new edition of Bale's "Handbook for Steam Users" (*Longmans and Co.*); and "The Mechanics' and Draughtsmen's Pocket-book," W. E. Dommett, and a new edition of Poole's "Telephone Handbook" (*Sir Isaac Pitman and Sons, Ltd.*).

OUR ASTRONOMICAL COLUMN.

DISTRIBUTION OF GLOBULAR CLUSTERS.—In continuation of his previous investigations of the distances of globular clusters, based upon the interdependence of absolute luminosity and period in the case of Cepheid variables, Dr. Harlow Shapley has reached important conclusions regarding the extent and arrangement of the sidereal system (Proc. Nat. Acad. Sci., vol. iv., p. 224). The clusters appear to form a large flattened system, the centre of which is in the galactic plane, at a distance of between sixty and seventy thousand light-years, in the general direction of the star-clouds of Sagittarius and Scorpio. The arrangement of the clusters and the relative densities of various parts of the Milky Way clouds strongly suggest that the whole sidereal system is roughly outlined by the globular clusters, and that stars, nebulæ, and clusters are all members of a single unit. The mean diameter of the proposed system appears to be at least 300,000 light-years. A further investigation has verified the existence of a local cluster of stars having a diameter of about 2500 light-years, and containing most of the brighter B stars, a majority of the A stars, and many stars of redder spectral types. The motion of the cluster as a whole is in the galactic plane, and nearly radial from the galactic centre. The observed systematic motions of the stars may be explained by the movement of the cluster through the general field of stars.

A NEW TYPE OF NEBULAR SPECTRUM.—Dr. V. M. Slipher has made the interesting discovery that two of the variable nebulæ give an emission spectrum which is quite unlike that of the ordinary gaseous nebulæ (Lowell Obs. Bull. No. 81). The spectrum of Hubble's variable nebula, N.G.C. 2261, was photographed in December, 1917, with a total exposure of nearly thirty-seven hours, the slit being placed north and south over the nebulosity and nucleus. In most essentials the spectrum of the nebula is identical with that of a new star in the early bright-line stage, when the majority of the lines, other than those of hydrogen, are identical with enhanced lines. The resemblance to the typical nova spectrum is further emphasised by the presence of absorption bands on the more refrangible sides of the bright lines of hydrogen. The variable nebula N.G.C. 6729 reaches only a low altitude at Flagstaff, but, so far as can be judged from the photograph obtained, its spectrum is a duplicate of that of Hubble's nebula. The latter is of "cometic" form, and the nucleus is the variable star R Monocerotis, which was of the 12th magnitude when the spectrum photograph was obtained. The light of the nucleus is identical with that of the nebula, and it is therefore probable that the nebulosity derives its light from the star. The further study of these objects may well be expected to throw considerable light on the nature of temporary stars.